

# NIEHS News

## University of Rochester— Leaders in Heavy Metals

The following article on the *Environmental Health Sciences Center at the University of Rochester* is the first in a series of articles that will appear intermittently in NIEHS News, highlighting the activities of Environmental Health Science and Marine and Freshwater Biomedical Science Centers. Environmental Health Sciences Center (EHSC) grants are core grants that provide support for personnel, equipment, supplies, services, facilities, and program enrichment. EHSC grants also provide funds for feasibility or pilot studies. Ongoing research projects are funded independently through other mechanisms, such as program project grants, individual research grants, contracts, and grants from outside the National Institutes of Health. The Rochester Center is 1 of 13 EHSC grants funded by NIEHS. The underlying concept of the center program is to establish multidisciplinary centers where the best researchers in a diversity of fields can work together to solve environmental health science problems and to prevent, intervene in, or treat environmentally related disease and dysfunction. The centers also fulfill training and outreach objectives as part of their mission.

Metal toxicity is among the foremost concerns in environmental health sciences today, both because of its effects on large populations on an international basis and because it is an area where prevention and intervention hold real and immediate promise. The EHSC at the University of Rochester has long been on the cutting edge of metal toxicity research. Thomas W. Clarkson, chair of the Department of Environmental Medicine at Rochester, directs the center, which is internationally known for its long-term work on mercury and other metals.

### History

What was to become the Environmental Health Sciences Center at the University of Rochester originated during the 1950s when the university was asked to assess the toxicity to workers in the production of the

first atomic bomb. Interdisciplinary teams were established to make use of the skills in biology, chemistry, and physics available at the medical school at Rochester.

In the 1960s the neurotoxicology program evolved with establishment of the first behavioral toxicology laboratory in the United States in 1965. The toxicology training program was started in 1966 when the university and the New York State Board of Regents approved a PhD program in toxicology. The Rochester center was funded through a training grant in 1966, the year NIEHS was established as the Division of Environmental Health Sciences within the National Institutes of Health. Funded as an official EHSC in 1975, the Rochester center has enjoyed continuous support since.

The Rochester Conference Series on Environmental Toxicology began in 1968.



The purpose of this series was then, as it is today, to identify research issues not previously addressed. For instance, the first conference focused on the issue of chemical fallout and warned the scientific community of the dangers of methylation of mercury and its accumulation in fish. The conference series has become an important activity of the Rochester center.

During the 1970s, Rochester embarked on a major interdisciplinary program to investigate the largest outbreak of mercury poisoning in history. The poisoning occurred in Iraq and was caused by the inappropriate use of a methylmercury fungicide on the nation's wheat crop. When the wheat was harvested and made into bread, a staple in the Iraqi diet, thousands were poisoned. Four to five thousand deaths were reported. In 1972, the University of Baghdad requested that the University of Rochester assist in remedying this catastrophic outbreak because of the expertise developed at Rochester for removing methylmercury from the body. This research was originally supported by the National Science Foundation through the newly established Research Applied to National Needs program. In 1975, NIEHS recognized the importance of maintaining the Rochester team of scientists by awarding the University of Rochester a center grant. The scope of the Rochester center has expanded greatly since 1975, but the basic premise of a team approach still applies.

### Research and Training

The Rochester center is a focus for research and training in environmental and occupational toxicology, providing an atmosphere and structure that maximize the potential of faculty and students alike. The three major programs within the center are cellular and molecular toxicology, neurotoxicology, and pulmonary toxicology. Environmental toxicants such as metals (mercury and lead), air pollutants (ozone and acid aerosols), and halogenated hydrocarbons (dioxin and haloalkenes) are a few examples of toxicants currently under investigation. Other areas of research include estrogen receptors, regulation of heme oxygenase, and toxicants affecting the visual system.

In 1992, the Department of Environmental Medicine was formed to recognize the growing importance of environmental health sciences as a new area of research and teaching in medical school. The administrative core of the center resides in this new department. Environmental



**Poison fish.** The center has studied 800 mother-infant pairs for signs of methylmercury poisoning from fish caught in the Seychelle Islands.



U. of Rochester

**Mercury poisoning in Iraq.** In response the center developed two new treatments to remove methylmercury from the body.

medicine brings together environmental and occupational medicine into one administrative structure and greatly enhances interaction between basic toxicological programs and human studies.

Over its 27 years of operation, the EHSC at Rochester has grown and developed into a dynamic and productive organization that promotes research and training in a number of ways such as promoting interdisciplinary studies to investigate complex research questions (the Rochester Center includes investigators from 10 different departments or administrative units within the medical school); promoting new developments and innovative ideas through its pilot project and enrichment programs; serving as a national and international forum through its Rochester Conference Series; and serving as a national resource to respond to emergency situations related to its areas of expertise.

Pulmonary toxicology was established as a major program in the early 1980s and has extensive facilities for inhalation exposure of animals to gaseous and particulate airborne toxicants. A unique center facility for exposure of humans to precisely controlled levels of selected air pollutants is located in the metabolic ward of the university's Strong Memorial Hospital.

In the late 1980s, the molecular and cellular toxicology program was established to bring new expertise to existing center programs. At the same time, the medical school introduced a number of endowed dean's professorships to allow appointments of distinguished scientists to develop new areas of research. The center was awarded a dean's professor of toxicology. This new appointment, along with other senior faculty, expanded the molecular and cellular program into the area of biotransformation/bioactivation mechanisms. This program began with studies on the estro-

gen receptor, which in turn supplied much of the technology for studies on other receptors that ultimately identified the Ah receptor as the dioxin receptor.

In 1991, the center was awarded a large program grant from the National Aeronautics and Space Administration to investigate health hazards to astronauts posed by chemical and microbial contaminants in space craft. This research is critical to assessing risk, especially of long-term space missions such as that envisioned in Space Station-Freedom. This program combines the resources of biomedical scientists at Rochester; aerospace engineers from the University of Colorado; Martin Marietta Corporation, the largest U.S. aerospace company; and the Center for Advanced Space Technology in Virginia.

### Outreach

Environmental health outreach has long been an integral part of the Rochester center's mission. Results of the basic research carried out in Iraq and results of subsequent studies of methylmercury toxicity in more than 800 mother-infant pairs in the Seychelle Islands, a British Commonwealth nation northeast of Madagascar, have been used by the World Health Organization, the U.S. Environmental Protection Agency, and other regulatory agencies in human risk assessment.

The Rochester center also serves its local community by responding to community needs. Center faculty are involved in an academic program leading to a master's degree in environmental studies and industrial hygiene that is used by local industry to train middle-management per-

sonnel. Center faculty also participate in local, national, and international committees responsible for establishing policy on a variety of environmental issues.

The Rochester center is a pioneer in developing the multidisciplinary and multifaceted concept that is the standard for all 13-EHSCs funded by NIEHS, a concept that is also a model for the institute's 5 Marine and Freshwater Biomedical Centers. Clarkson commented, "Without a structure such as this, it would be impossible to create a focus on environmental health issues in a large, multidisciplinary institution such as the University of Rochester."

Kenneth Olden, NIEHS director, said that the communication between NIEHS and the centers "creates a truly national community of environmental health scientists that draws from major research universities throughout the nation and from a great diversity of academic disciplines. This gives the NIEHS Centers Program a truly national and international reach, and a worldwide impact on the improvement of public health."

### NIEHS Breaks Ground on Future Research

NIEHS conducted official groundbreaking ceremonies September 13 to celebrate the construction of a four-story, 155,000-square foot addition to its research and administrative building at 111 Alexander Drive in Research Triangle Park, North Carolina. The free-standing addition will provide 245 new laboratory modules to accommodate diverse research initiatives. In addition, there will be a specially



**New department.** Kenneth Olden looks on as Dean Marshall A. Lichtman congratulates Thomas W. Clarkson, department chairman, and Mark Utell, associate chairman for clinical affairs, at the opening of the Department of Environmental Medicine.

designed and constructed building for research using magnetic resonance imaging (MRI) and administrative areas.

Upon completion, scheduled for 1996-97, the space will provide a centralized location for the research required to investigate the health effects of environmental agents and to develop new ways to prevent, intervene in, and treat diseases and dysfunctions associated with the environment.

Speakers at the groundbreaking included Congressmen David Price and Tim Valentine of North Carolina. Also speaking at the event was Ruth Kirschstein, acting director of the National Institutes of Health, and Jonathan Howes, secretary of the North Carolina Department of Environment, Health and Natural Resources.

Opening remarks were made by Kirschstein, who commented on the rich scientific community in Research Triangle Park and its surrounding universities. In his remarks, Kenneth Olden, director of NIEHS, praised the first two directors of NIEHS, Paul T. Kotin and David P. Rall, and their many scientific colleagues who established such a strong foundation for the institute's research over the last decades. Olden also stated that, "Environmental health science research is now poised to make quantum advances in our understanding of how environmental agents interact with genetics and other intrinsic factors to cause human diseases and dysfunctions. We now have the database and we know the questions to ask and, most importantly, the tools are available to answer them."

Secretary Howes in his remarks said, "Quite literally, all of our lives and the lives of people all across our country are touched in some way by the activities here at this institute." Congressman Price noted that numerous diseases and dysfunctions, such as cancer, birth defects, infertility, and neurological and respiratory disorders, have a major environmental component. "Because environmental exposures can often be avoided or mitigated, their control represents one of the nation's most promising ways of improving health and reducing health care costs," said Price.

Congressman Valentine pointed out, "The work that goes on here under the auspices of the NIEHS and the EPA provides the essen-



**Groundbreaking research.** (left to right) Congressman David Price, NIEHS Director Kenneth Olden; Acting Director of NIH, Ruth Kirschstein; Congressman Tim Valentine; and Secretary of the North Carolina Department of Environment, Health and Natural Resources, Jonathan Howes, pitch in on start

tial information for government, industry, and consumers, as each of us seeks to make our world a cleaner, safer, healthier place to live. . . . This new facility increases our opportunities to leave to future generations a world that is cleaner and healthier than the world we have inherited."

Congress has provided an initial \$19.9 million to begin construction of the new facility. Project costs for the new module, MRI building, and changes to the power plant are estimated at \$45 million, with \$13 million in contracts already let. Completion of the new module will enable NIEHS to consolidate its intramural research on the institute's south campus and close its north campus facility, which is leased.



**Ethel B. Jackson**—Extensive experience in NIH peer review has prepared her for job as chief of Scientific Review Branch.

## Jackson Appointed Chief

Ethel B. Jackson has joined the NIEHS Division of Extramural Research and Training as chief of its Scientific Review Branch, which plans, directs, and carries out the review of all institute applications for grants and awards, and administers and coordinates review committees. Jackson joins NIEHS from the National Institute for Nursing Research, which like NIEHS is a constituent agency within the National

Institutes of Health, where she served as chief of the Office of Scientific Review as well as executive secretary to the National Advisory Council for Nursing Research.

In announcing Jackson's appointment, Anne P. Sassaman, director of the Division of Extramural Research and Training, stated that Jackson's extensive experience in the NIH peer review process ensures that this important function of NIEHS extramural operations will maintain its high quality of service to the scientific community. NIEHS funds a wide range of individual research grants, program project grants, training grants, and center grants. Its center grants programs include the Environmental Health Sciences Centers, Marine and Freshwater Biomedical Science Centers, and Developmental Centers. The Superfund Basic Research Program is also a component of the institute's grants portfolio.

Among its other functions, the Scientific Review Branch is the focal point for coordination of the initial peer review of special applications specific to NIEHS, including the centers programs and those high-priority programs solicited through requests for applications. It also coordinates grant and contract review with other NIEHS divisions and the Division of Research Grants at NIH and develops and coordinates policies relating to scientific review within the NIH system.

Jackson's previous positions include serving in the Division of Research Resources, NIH, and at the Pan American

Health Organization, where she designed programs and formulated policies regarding dental health and development of dental services in the northern Caribbean.

### **Estrogens in the Environment III**

NIEHS will sponsor an international scientific conference, "Estrogens in the Environment III: Global Health Implications," January 9-11, at the Hyatt Regency Washington on Capitol Hill, in Washington, DC. This is the third conference to focus on concerns about chemicals

in the environment that mimic the properties of natural estrogens. Sessions will be devoted to cell biology of estrogens, non-traditional sites of estrogen action, effects of estrogenic chemicals on development, environmental sources of estrogens, and effects of environmental estrogens on humans and wildlife.

Organizers of the conference are John A. McLachlan, NIEHS scientific director, who has done pioneering studies on the health effects of diethylstilbestrol in the mouse, and Kenneth S. Korach, of the NIEHS Laboratory of Reproductive and

Developmental Toxicology, who has also done extensive estrogen-related research. McLachlan points out that a great diversity of chemicals in the environment act as estrogens in the body, and that their impact on reproduction, development, and health is still only partially understood.

Attendance is limited and early registration is recommended. For information on the program and for registration material, contact Vickie Englebright, (919) 541-3337, FAX (919) 541-0696.